

FEATURE PROJECT

WOODCUBE

PROJECT INFORMATION

Location:	Am Inseipark, 21109 Hamburg, Germany
Project Development:	DeepGreen Development, WOODCUBE Hamburg GmbH
Architect:	Architekturagentur, Stuttgart
Design:	Isenmann Ingenieure, Haslach
Structural:	Baubiologische Beratung Wilfried Schmidt
Building Biology:	Tichelmann & Barillas TIB Ingenieurgesellschaft, Darmstadt
Fire Safety Planning:	Thoma Holz100 GmbH
NFA:	3,430.0 m ²
Building volume:	KfW Efficiency House 40
Energy standard:	18 kWh/ m2 per year
Heat energy requirement:	39,3 kWh/ m2 per year
Final energy requirement:	21,3 kWh/ m2 per year
Construction costs:	€ 3.8 million
Construction time:	September 2012 to May 2013
5-Storey Apartment Building:	8 residential units, total floor area of 1,479 sq m (16,000 sq ft) - each units measures between 90 to 190 sq m (968 to 2,045 sq ft).

Sustainability was the concept behind the “WOODCUBE” project. This informed the decision to use chemically untreated, carbon-neutral wood as a construction material. The “WOODCUBE” is made entirely of wood, with the exception of the foundations and access core. The structure, walls, insulating materials and surfaces are all timber: wood is a smart material, and the “WOODCUBE” has harnessed its positive properties. The project is aimed at ensuring that the building can be run in an energy-efficient way, as well as, considering the use of energy in producing the materials, the impact on the health of the building users, and the legacy of deconstruction.



UNIQUE WALL SYSTEM

The building shell is one of the most crucial elements in application of “Smart materials” in the construction of the WOODCUBE. The manufacturing of Holz100 exterior wall was achieved without the use of glues or chemicals. With the natural properties of solid wood preserved and unaltered, the Holz100 building wall system can dynamically react to environmental changes, enabling energy flow and maintaining indoor climate conditions. The WOODCUBE achieves the energy standard of a passive house and is the first building in Germany to achieve a Category 4 building in wood without adding an additional fire protection layer of a non-burning material.

The exterior walls are loadbearing made of 32.4cm Holz100 solid timber with dowel-cross lamination. The board layers of the wall elements are mechanically joined with beech wood dowels. The beech wood dowels are kiln-dried and hydraulically pressed into predrilled perforations in the board stacks. The system remains solid as one component and airtight through friction and pressure as the beech wood dowels swell and compress with the building humidity levels. No separate component is required in the manufacturing of the Holz100 system.

The solid wood system consists of an 80mm thick static core cross laminated with side board layers ranging in thickness from 26mm to 29mm, applied crosswise and diagonally. The wall elements of the WOODCUBE contain an additional 4cm thick layer of soft wood fiberboard with milled grooves that provided integrated structural insulation. The milled grooves create macroscopic air cushions within the wall cavity that reduce the wall's thermal conductivity, thus improving thermal insulation. The thermal conductivity of the Holz100 system is 0.078W/mK compared to the average soft wood conductivity of ~0.12W/mK.

FIRE SAFETY

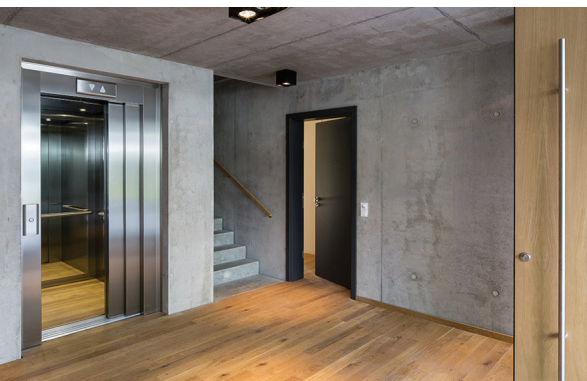
The outer wall components are resistant to fire from the inside for more than 90 minutes, due to the inbuilt 84 mm thick sacrificial layers, which burn at 0.9 mm per minute under optimal ventilation conditions. The sacrificial layers delay the fire reaching the load-bearing core layer by approximately 93 minutes. The 80 mm thick load-bearing core layer can be expected to burn through by another 15 mm. The building thus has a fire resistance capacity of about 120 minutes.

For the floor and ceiling elements, the lower cladding of the solid wood elements is applied as a burn-up layer. This reduces the requirements for the stacked board core to 28 minutes. In order to ensure that there is smoke control between the residential units, the upper sides of the floors are completely covered in the product Pro Clima Intello, and professionally joined together and made flush with the walls.



BUILDING BIOLOGY

The concept of biorecycling potential was continued in choosing the materials for the interior and finishing of the building as well. The unglued, solid wood boarded flooring is sealed with linseed oil, while the façade cladding is made of untreated larch wood, the insulating material of soft wood fibreboard, and all of the sealing sheets and tapes have a cellulose base. In order to create a healthy indoor climate without building materials that contain problematic substances, the paints are mineral, the construction panels are designed to purify the air, and the interior doors are tested for harmful substances. Integral windows with a 20 per cent lower aluminum content were installed in order to increase energy efficiency.



NEUTRAL CARBON FOOTPRINT

Even though the basement and the staircase core of the were built in reinforced concrete, a carbon footprint calculation by INA / TU Darmstadt proves that the WOODCUBE is the first building with a neutral carbon footprint upon completion.

Energy-saving technology was built into the energy concept of the WOODCUBE to support the resource efficiency of the solid timber system of the building structure. All apartment units have controlled energy units with smart monitoring. The units use a heat recovery ventilation system and radiation heating. The core elevator is fitted with a brake energy recovery system – which cuts down energy consumption by an estimated 60%, as well, the WOODCUBE operates a rooftop solar panel system to produce all the electricity required for the building systems. Excess power generated by the photovoltaic system is fed into the local grid and credited to the building's life cycle assessment resulting in a carbon balance for the operation of the WOODCUBE.



Thoma
Holz100 Canada

FEATURE PROJECT **N11 SOLAR HOUSE**

PROJECT INFORMATION

Location: Gewerbestrasse 4, CH-3770 Zweisimmen, SWITZERLAND

Clients: Regula Trachsel and Sascha Schär

Architects: N11 Architects, Zweisimmen, Sascha Schär

GFA: 520 m²

Construction costs: 850 000 euros (1.28 million CAD)

Construction time: March to October 2014

Award: Recognition Award Constructive Alps 2015

Wooden construction: Thoma Holz, Goldegg, www.thoma.at

Leveling floor under floor slab: (foam glass ballast) Misapor, Landquart, www.misapor.ch

Windows: Wenger Fenster, Wimmis, www.wenger-fenster.ch

Assembly work and facade: Carpentry Kunz, Zweisimmen

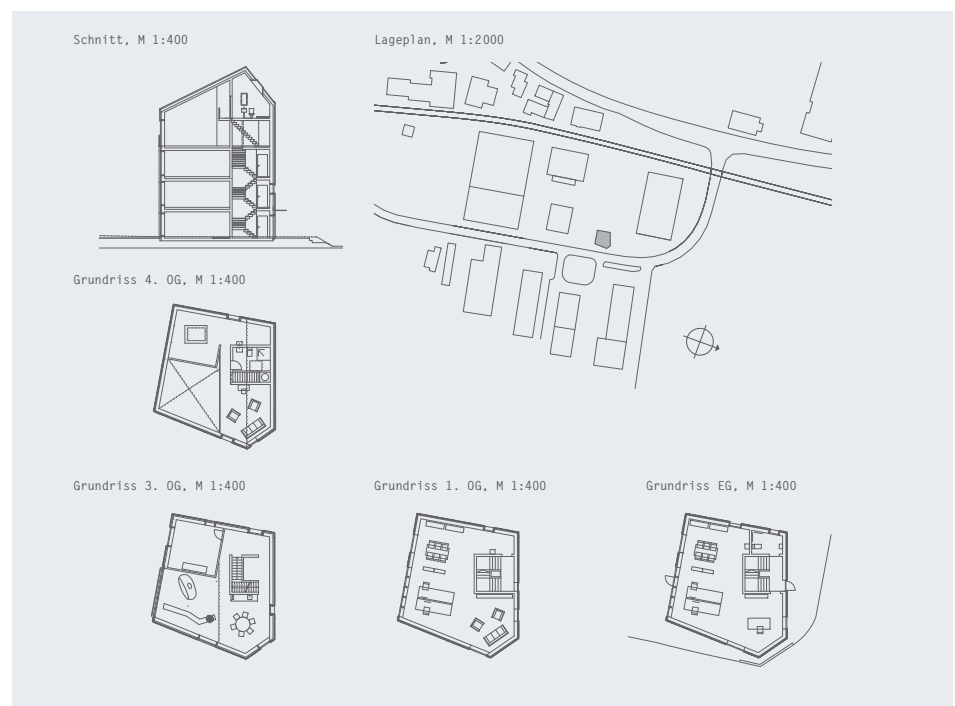
5-Storey Building: Ground Level – Office & Building Material Trades
First Level – Office or Retail for Third Party Vendors
Second Level – Office of N11 Architects
Third Level – Loft Gallery & Residential Apartment
Fourth Level - Residential Apartment

OFFICE and RESIDENTIAL BUILDING, made almost exclusively of wood, without heating technology. Wherever possible, the N11 architect followed the CRADLE-TO-CRADLE principle. The wood is untreated and assembled with screws and wooden dowels – no glue or composite materials have been used. In the future, the building can be broken down into its individual parts and be reused, recycled or fed back into nature as compost.



WOOD STRUCTURE

The 5-storey building structure was constructed in 5 days with the Holz100 pre-fabricated wood wall elements and wooden interior walls that required no glues, chemical adhesives or additional finishing. With the Holz100 solid wood construction in combination with a wood-concrete composite ceiling and rammed earth floor, the necessary mass for energy storage could be achieved. By increasing storage mass in the walls and ceilings, passive energy could be stored within the building components, eliminating the need for artificial heating and cooling technology.





SOUTH GLAZING

Apply passive design principles, in the winter, the glazing in the south allows the sun to penetrate deep into the building. The radiation and heat from the sun is stored in the storage mass of the floor and walls and released gradually to help warm the space. In the summer, the sun is high and only reaches the foremost areas of the rooms. With windows as deep as the walls, blinds could be eliminated.

Measurements since the project completion, has been proven that the winter room temperature does not drop below 18 degrees and does not exceed 25 degrees in the summer.

The only equipment used in the building is the photovoltaic system on the roof to supply electricity and a heat pump that can be used to supply hot water for residential showering.



FACADE

The exterior walls were constructed of Holz100 30cm thermal wall with a 6cm thick wood fiber insulation. Spruce wood timber bark - often used for construction of shipping pallets and considered a “waste product” was cut into 6cm wide x 4cm thick strips transformed into a lively sawn timber façade for the N11 building.

FEATURE PROJECT **ARCHENEO**

PROJECT INFORMATION

Location: 22-24, Pass-Thurn-Straße, 6372 Oberndorf in Tirol, Austria

Clients: Municipality of Oberndorf

GFA: 6,600 m²

Construction Costs: 12M Euros (18.1M CAD)

Project Year: 2010

Annual Energy Consumption: ~209,000 kWh

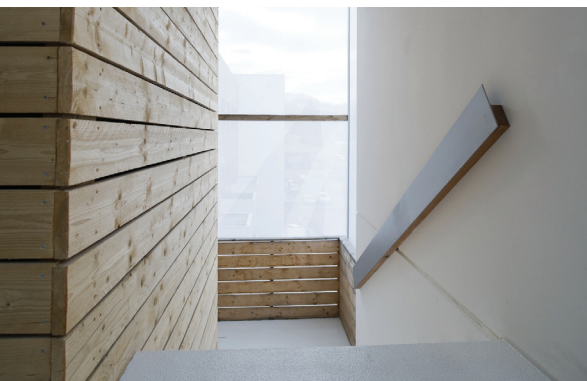
Annual Energy Yield: ~ 226,750 kWh

Award: Climate-Neutral Building, 2019

ArcheNEO is a carbon-neutral, energy-self-sufficient industrial business complex built with innovative timber construction with steel framework. Geothermal energy from a depth of over 200 meters and electric energy produced from a 1,300 m² rooftop solar power system is utilized as the primary energy sources of the building. The holistic energy approach of ArcheNEO has saved a total of 115 tonnes in Co2 emissions each year.

The **3-Storey Building** is built from 36.4cm thick Thoma Holz100 thermal system.

The ARCHENEO is the first energy-autonomous solid wood building with zero grams of CO2 emissions in Austria. The building is active in producing more energy than it consumes. The extra energy supply is stored and used for the operation of electric vehicles.



SUSTAINABILITY & CLIMATE NEUTRAL

Wood construction was chosen instead of concrete due to cement being a major contributor to climate change and the immense contribution of Co2 production. Thoma Holz100 was responsible for 2,500 m³ of timber construction processed into floors, walls and ceilings in the ArcheNEO. The building is powered by solar energy, thereby resulting in energy costs of \$0 and operating costs that are less than one €/m² – this is below the Austrian average of (2.50 € / m²).

In addition, the building uses heat pumps for indoor climate control. The ArcheNeo is cooled in the summer by natural ventilation, without air conditioning.



FEATURE PROJECT **VENLO CITY HALL**

PROJECT INFORMATION

Location:	Venlo, The Netherlands
Client:	Municipality of Venlo
Architect:	Kraaijvanger Architects, Hans Goverde
Landscape:	Copijn Landscape
NFA:	27,700 m ² (300,000 ft ²)
Green Façade:	2,026 m ²
Construction Costs:	\$46-\$53M
Construction Time:	2009-2016

11 STOREY BUILDING

Underground:	3-storey public parking garage, 450 parking spaces
Ground & First Level:	Public Hall, Plaza & Exhibition Space
Second - 8th Level:	Office Space, ~ 630 work stations
9th-11th Level	Greenhouse, Solar Chimney

The Venlo City Hall is the first public Cradle to Cradle whole building design in the Netherlands, focusing on a healthy work environment and sustainable innovations. Materials were chosen for their sustainability and life-cycle impact. When a product or service reaches the end of its useful life, the raw materials must be easily retrieved and re-used. C2C Certified products from 21 companies were specified throughout the building. The building operates on renewable energy sources, including a three-storey greenhouse that provides natural heating for the building and heat storage. Energy efficiency investments are estimated to be recovered within three years of operation.



AIR PURIFYING GREEN FAÇADE

The most impressive feature of the building is its northern 'green' façade. More than 100 different plants make up the biodiversity of the living green wall. The green façade covers 2,000m² and was designed to filter the surrounding air pollutants and offset the emissions from the nearby motorway by using energy harnessed by natural airflows and a well-balanced internal climate. Energy efficiency investments are estimated to be effective within three years.



HOLZ100 WOODEN INTERIOR WALL STRUCTURE

The inner leaf of the structural wall is made of Holz100 elements – this makes the interior solid wood shell structure of the Venlo City Hall completely cradle-to-cradle. The absence of glues and chemicals allows for future internal refurbishing and in which the wood can be disassembled and up-cycled into new and useful products without waste.

ENERGY EFFICIENCY

The building operates on renewable energy sources, including a three-storey greenhouse that provides natural heating for the building and heat storage. Integration of a geothermal heat pump, the nearby Maas River and rain water collection also helps heat and cool the surrounding roads and homes. Energy efficiency investments are estimated to be recovered within three years of operation.

